

Written for Quarterly but not used

ROAD SIDE GEOLOGY

Just below my Los Angeles home on one of the hills south and west of the reservoir known as Silver Lake, a neighbor is preparing to build a garage. For a day or so mechanical equipment chewed into the hillside, and rumbled off again leaving a square excavation. To the casual passerby, perhaps this excavation is just a "hole-in-the-bank." But to some of us it is glimpse backward in time -- back about 20 million years, when the hill on which we live was not a hill but the quiet depths of the ocean.

Fine sands and silt, and particles of marine life were deposited on the ocean floor. Gradually through thousands of years the deposits accumulated, slight differences in current resulting in a variance of deposition so that the sediments now hardened into shale appear in layers. Later -- a few million years later ! -- the whole great undersea mass was subjected to a series of earth movements so that as we now observe these shales, they no longer lie horizontally as they did in eons past, but are tipped at a decided angle upward from south to north. In the shales are fragments of bone and scales of fish, ^{and} tiny fragments of ^{sea} plants, and microscopic bits of shells of marine animals, giving evidence of the marine life of the geologic epoch known as the Miocene.

Above the tipped Miocene shales lies the soil of Recent time. What of the period of time between those marine beds and the modern soil? Several million years elapsed with no record of it here. This fact in itself adds to the story of our hill. From the evidence of this one excavation alone we cannot tell exactly what occurred, but we surmise that the movements of the earth

which produced the tilting of the beds must have played a part in raising them to their present high position (500 feet above ~~the~~ sea level). Above the water, with no further marine sediments added, the process of erosion began. Those sediments which once topped the particular shales we now can see, were worn away to produce the present contours of the hills as we know them today.

Stories such as this can be found in many roadside cuts in and about Los Angeles. Miocene marine rocks are revealed in numerous areas from the valley to the beaches. In some places nearly complete skeletons of fishes can be found, and in rare instances portions of sea birds. In the hills back of Lincoln High School, a nearly complete small whale was unearthed, the skull of which is now exhibited below the full skeleton of a modern whale in the Museum's Hall of Osteology.

In scattered sections of the city, marine beds of the Pliocene epoch, 2 to 5 million years old, are found. In the downtown area, around the Third Street tunnel, and through Bunker Hill over to the Library on 5th street, Pliocene sands may be seen atop the tilted Miocene shales. In some places these sands bear the shells of clams, oysters, scallops, and the like. A single bone of the flightless bird, *Mancalla*, was found with the shells excavated at the Third Street tunnel. These discoveries lead us to wonder if possibly our hillside, too, had been submerged at that time, and that Pliocene sediments had once been present but had eroded away since the land was raised.

Still another geologic epoch intervened between the

Pliocene and modern days. During the course of this, the Pleistocene epoch, the sea encroached less and less beyond its present levels. Consequently marine Pleistocene rocks are to be looked for near the beaches, especially at Palos Verdes where the high cliffs and level surfaces reveal terrace lines showing the gradually lowering levels of the Pleistocene beaches. In banks along many of the residential streets of San Pedro, comparatively loose sands nearly horizontal in position and filled with fossil shells fifty to a hundred thousand years old, can be seen topping the tilted Miocene shales. Such shell-bearing Pleistocene deposits may be found as far inland as the Baldwin Hills. Inland streams, lakes and other fresh water sources of sedimentary deposition during the Pleistocene time, have left their traces too, especially in the south part of Los Angeles, and Inglewood. In these and in the great tar deposits of Rancho La Brea in the Wilshire district, bones of large land mammals can be found, particularly mammoth, mastodon, ground sloth, camel and the like.

Not all the rocks you may see around Los Angeles are of the sedimentary variety in which fossils occur. Many of them, especially in the Griffith Park area, and in the Santa Monica mountains, were once molten masses which were thrust up from the earth's interior. They are often easily distinguished from the sedimentary type by their crystalline, or occasionally glassy structure. Naturally no remains of living creatures could have withstood the heat which accompanied the formation of such rocks. So if you are interested in finding fossils, these can be passed by.

But where the rocks appear in layers and are made up of sand or silt, sometimes well hardened, again loosely held together, an occasional stop may repay you with a handful of shells, a shark's tooth, and, if you're really lucky, a bone. An avid fisherman friend of mine declares that one of his most enjoyable "fishing" days was spent in the Sepulveda Canyon-Mulholland Drive area splitting the Miocene shales to find skeletons of Mackerel, Herring, Rockfish and Cod which lived 20 million years ago!

Good hunting! And remember the Museum when you make an interesting find!

Hildegarde Howard
Curator of Avian Paleontology

To Dr. Combs 5.10.46
1947 - for use in
co. Employees magazine
Never used

THE BIGGEST BIRD

By

Hildegarde Howard

Southern California is justly proud of the fact that its mountain slopes provide shelter to the last of the California Condors -- the largest living birds of flight, whose spread of wing from tip to tip has been measured at ten feet. We are proud, and we are also vigilant to see that no harm comes to the few remaining survivors of this ancient race.

If we turn back several thousand years in time -- back to days before even the red-man hunted along these shores, to days when the great ice sheets crept into parts of what are now the United States -- we find that Condors were abundant. They were abundant not only in the mountain areas, but in the wide valley which today is Los Angeles. Proof of the existence of Condors here so long ago is afforded by the fossil collections from the famous asphalt pits of Rancho La Brea, housed in our own County Museum in Exposition Park. Among the 85,000 bird bones taken from the pits by the Museum, are hundreds of Condor bones.

In addition to the tar-soaked bones of these recognizable California ancestors of the present-day Condor, the La Brea deposits revealed the existence of a still greater bird which frequented our land some fifty to a hundred thousand years ago. This bird, which has received the name of Teratornis (meaning "terrible bird"), was as much larger than the Condor, as the Condor is larger than an

eagle. It had a heavy, broad body, its wishbone measuring eight inches across, and the wings were very long. The legs, however, were comparatively short, and one wonders how the bird was able to gain sufficient momentum to launch its great body into the air from level ground. Though its head was broad and the beak high and sharply angular, suggesting the eagles, the feet and claws were weak and could never have provided a vice-like grip such as possessed by these highly predatory birds. Presumably, like the Condor, *Teratornis* was vulturine in habits, though possibly its very large and sharp beak enabled it to pierce the carcasses of larger animals with tougher hides than those on which the Condor feeds.

In Hancock Hall of Rancho La Brea Fossils at the Los Angeles County Museum, the mounted skeletons of *Teratornis* and the Condor are shown in adjacent cases so that the visitor can make his own comparisons. Both birds are mounted with wings extended. Across the skeleton from wing tip to wing tip, the Condor measures 5 feet 5½ inches, *Teratornis* 7 feet. To estimate the extent of the wing in life, another 2 to 2½ feet should be allowed on each side for feather structure, giving the Condor a spread of nearly 10 feet, and *Teratornis* about 12 feet.

With these two birds now on display at the Museum, are eight others from Rancho La Brea, providing an exhibition of Ice Age birds unequalled anywhere in the world. More bird skeletons are in process of preparation. One of these is a second mount of *Teratornis* in a position of repose, with wings folded. The two specimens are designed to be used together as one of the several groups planned when space permits the expansion of the display of

Rancho La Brea fossils.

Of the 110 different kinds of birds found in the tar deposits, Teratornis is perhaps the most outstanding. Unquestionably it was the largest flying bird known to have existed at any time. Other, larger-bodied members of the feathered tribe, such as the Moa, or even our living ostrich, were, and are completely incapable of flight. Even in the distant past, therefore, Southern California maintains its supremacy as the mother country of the biggest flying bird.

For "evolving life" leaflet.
Hedgcock House

Not Published

October 29, 1949

TO LIVE IS TO CHANGE

2200-2500 70

Change is a basic principle in all living things. Life is never static. Consider yourself. Your body is continually undergoing change -- the food you eat builds new cells, and through the years you find it hard to identify your infant photos with the person you are today. Later you marry and your baby son begins the process of growth anew -- similar to you to be sure, but never quite identical. ⁴ Why is he not identical? Because of nature's remarkable provision that only half of the tiny filaments (chromosomes) in your cells which bear the hereditary factors (genes) shall be passed on to your offspring. The other half needed to provide him with his full quota must come from his other parent. Furthermore, at times actual changes ^(mutations) may occur in the chromosomes or in the genes, producing characteristics which had not before occurred in either parent. In a natural state such changes are so small that within a lifetime they may appear unimportant. We have all seen, however, what can be done under experimentation -- producing different breeds of domestic animals or varieties of plants. The change, for example, which produced squat legs in dogs was taken advantage of by man. Selecting out the short-legged individuals from the rest of the stock and breeding them together over a period of time, resulted in the dachshund.

86

Selection is practiced by nature, too. Animals and plants in nature must be adjusted to the place in which they live -- to its climate, its geographical features, and to the other animals and plants with which they are associated. The better a living creature is adjusted to its surroundings the more chance it has to survive and to pass on its inheritance to the next generation. In other words, nature tends to select characters which increase the animal's or plant's special fitness for its life conditions.

These characters may take the form of outstanding adaptations to some specific environment, ~~xxxxxxxxxx~~ as for example, the fleshy, spined stems of the cactus which provide water storage for the plant through the drought of the desert summer, and at the same time protect this precious reservoir against mirauders. Or they may be less clearly defined. Actually, evidence of selection appears everywhere in nature. Instances of adaptation to the environment are so common that we may have failed to recognize in them the result of nature's long process of selection. Among the less spectacular adaptations which nature has selected, is the hair color of some of the small rodents. Generally speaking, our native rats and mice which live in the sandy desert regions tend to be of lighter color than their relatives of the neighboring brushy canyons. Scientific investigation has produced evidence that this coloration is hereditary and is not due to any chemical effect of the environment upon the hair itself. The individuals whose color is least conspicuous have the best chance to survive and are thus "selected" to pass on their hereditary coloration to the next generation.

Selective breeding by man, or in nature, implies the isolation of the group to be bred, from the parent stock. Whereas man can place his domestic animals in separate pens, nature must depend upon natural barriers -- mountains, rivers, or just distance alone. ^{or perhaps some ~~kind of~~ physiological traits which hinder mating} It is a natural consequence of the multiplying of living things that they tend to spread out in space. New colonies are formed in this way. In each colony, ^{mutations may give rise to} new characters ~~arise~~ which did not occur in the parent stock. After many generations, as a group becomes widely distributed geographically, and different colonies have become fitted for different types of surroundings, the individuals of one colony may be markedly different from those of another. At the same time a more or less continuous and overlapping series of "races" may be traced from one extreme to the other.

The extermination of these "in betweens" ~~which would~~ would leave two distinct forms. In some such manner the minute changes which occur from one generation to the next could eventually lead to separate species, families, or to groups of more marked distinction.

The task of pigeon-holing -- or classifying -- various living things is often complicated by the presence of intermediate living forms. Should the whole of life since its beginning be spread before us at one time, it would likely be impossible to draw clear cut lines between all of the groups we recognize today. The separations which exist now represent tremendous periods of time in which changes have occurred, and intermediate forms have disappeared.

For nature, being infinitely more patient than man, does not achieve her results according to man's time'scale. Nature's time is geologic time. This is calculated on the basis of the major earth movements which have occurred in the course of the earth's history, and is measured in eras, divided into periods, and then epochs. The duration of even the epoch runs into millions of years.

To appreciate the changes which nature has achieved we must adjust our ~~thinking~~ ^{must be adjusted millenia rather than decades} thinking to geologic time. ^{This adjustment can best be accomplished by an examination of}
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definition record. Fossils are the remains and ~~traces~~ of animals and plants which lived in past geologic ages. Found in ancient rocks, ~~they~~ ^{fossils} furnish ~~our~~ ^{the} only tangible means of knowing about life far, far back of our own experience on earth.

The very earliest identifiable fossils come from rocks a billion years old. The only kinds of life represented are bacteria, simple seaweeds (algae), and sponges. Still older rocks contain carbon deposits which indicate that life was present, but no specific types can be identified.

It is believed that these earliest forms were very simple (one-celled) plants. For a comparison of the functions of plants and animals reveals the fact that only plants are capable of manufacturing food from the non-living elements of the water, air and earth. Through the miraculous process known as photosynthesis, the energy of the sunlight is absorbed by the green coloring matter ⁱⁿ ~~of~~ the plant, and is drawn upon to convert inorganic substances into food. Animals cannot do this, and ~~as~~ only as there is other life to feed upon can they exist. Primordial life, therefore, cannot have been animal, but must have had the plant's ability to derive food from lifeless material.

Turning again to the fossil record, we find that rocks of a half a billion years in age* contain the ~~rema~~ recognizable remains of

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*The calculation of geologic time in terms of years is based on the contained radioactive minerals,

types
a number of ~~kinds~~ of animal life, as well as various algae-like plants. All, however, were marine-dwelling forms, and there were no back-boned (vertebrate) animals. It is difficult to picture the land barren of life, and the sea without fish. The story continues with successively younger rocks: telling of the first appearance of land-dwelling plants and animals, and the occurrence of back-boned creatures in the sea, followed by those of the land. The first land vertebrates were the cold-blooded amphibians and reptiles.

space out so the line ends —————>

180 Selective breeding by man, or in nature, implies the isolation of the group to be bred, from the parent stock. Whereas man can place his domestic animals in separate pens, nature must depend upon natural barriers -- mountains, rivers, or just distance alone. It is a natural consequence of the multiplying of living things that they tend to spread out in space. New colonies are formed in this way. In each colony, new characters arise which did not occur in the parent stock. After many generations, as a group becomes widely distributed geographically, and different colonies have become fitted for different types of surroundings, the individuals of one colony may be markedly different from those of another. At the same time a more or less continuous and overlapping series of "races" may be traced from one extreme to the other. The extermination of these "in betweens" would leave two distinct forms. In some such manner the minute changes which occur from one generation to the next could eventually lead to separate species, families, or to groups of even more marked distinction.

137
separate The idea of evolution has raised much controversy in the past century. Unfortunately many persons think of it only as "man descending from the apes," and as this insinuation proves unpleasant, they fail to investigate its real significance. To the scientist, evolution refers to the origin of different types of living things by development from pre-existing life forms. It is not limited to the descent of any one group, nor does it attempt to explain the origin of life itself. It is applied particularly to the process whereby simple forms which first inhabited the earth gave rise, through an almost infinite branching and rebranching series, to the vast array of living things of today. And it further implies that the process is still in motion. Evolution, then is merely an expression of change over an extended time.

81 Nature, being infinitely more patient than man, does not achieve her results according to man's time scale. Nature's time is geologic time. This is calculated on the basis of the ~~major~~ earth movements which have occurred in the course of the earth's history, and is measured in eras, divided into periods, and then epochs. The duration of even the epoch runs into millions of years. To appreciate the changes which nature has achieved we must adjust our thinking to geologic time.

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44 The very earliest identifiable fossils come from rocks a billion years old. The only kinds of life represented are bacteria, simple seaweeds (algae), and sponges. Still older rocks contain carbon deposits which indicate that life was present, but no specific types can be identified.

93 By the time we reach a date of about 440 million years ago,* a number of kinds of animals and algae were recognizable, but all were (vertebrate) marine-dwelling forms, and there were no back-boned animals. It is difficult to picture the land barren of life, and the sea without fish. The story continues with successively younger rocks: telling of the first appearance of land-dwelling plants and animals, and the occurrence of back-boned creatures in the sea, followed by those of the land. The first land vertebrates were the cold-blooded amphibians and reptiles.

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The fossil record shows that for sixty million years, beginning about 200 million years ago, reptiles ruled the world. This was the time of dinosaurs on land, pterosaurs in the air, and several kinds of "swimming lizards" in the seas and rivers. Fossils give evidence ^{that the} first bird-like creatures, and ^{a few} tiny mammals also occurred during the time of reptile dominance. But not until about sixty million years ago did these warm-blooded creatures appear in large numbers and increased variety.

In this account of the fossil record, it should be noted that many linking forms occur which suggest the manner in which one form arose from another. For example the "bird-reptile", Archaeopteryx, of 150 million years ago, provides convincing evidence that birds descended from one branch of the reptiles, while the mammal-like cynodonts of still earlier times, indicate the offshoot of the mammals from another reptilian line. It should always be kept in mind that transitions of this nature have, on the whole, been gradual, and each was apparently a product of the particular age in which it occurred. We would, not, in other words, expect to find the eggs of a lizard, hatching into a chicken! The reptiles from which the group of birds stemmed off were probably the ancestors of the dinosaurs as well. The first bird-like fossil had a skeleton like that of some of the small dinosaurs which ran on their hind legs. It had jaws with sharp-pointed teeth instead of the toothless beak found in modern birds. But combined with its reptile-like skeleton, were feathers stemming from the short front limbs, along the body, and down either side of a long, bony tail.

As we consult the rocks nearer and nearer to our time, the animals and plants contained as fossils are more and more like those we know today. Forty thousand years ago a great many forms practically indis-

For sixty million years

tinguishable from those of today were in existence. Is it any wonder that we have not been able to witness within our short life span the transition in nature from one species to another?

What do we know of the past of man himself? By a comparison of man's body structure with that of higher animals, we learn first of all that physically* he fits into the Class of mammals -- those warm-blooded forms which have hair, and which suckle their young. Among the mammals, man's structure is close to that of the Primates -- the Order which includes the monkeys and apes and the little marmosets and lemurs. ^{Within} ~~Among~~ the Primates, blood tests indicate closest relationship of man with the man-like apes.

The earliest fossil Primate known comes from rocks of sixty million years in age. Other Primate fossils, dating from 20 to 30 million years ago, suggest that a separate line was even then branching to man as distinct from any one of the living apes. From a million years ago ^{throughout the Ice Age} ~~upward~~, fossil remains assignable to man have been discovered. Some primitive forms, such as Java Man, had heavy ridges over the eyes, a brain of ~~only~~ moderate size (though larger than that of any ape), a receding chin, and rather ape-like teeth. Neanderthal Man, who occurred a little later, had good brain capacity and man-like teeth, though the brow was still heavy and the chin receding. Other representatives of fossil man variously combined ape-like and man-like characters. No definite succession of these early types has been determined. In fact some of them appear to have been contemporaries of each other, suggesting that the ^{Ice Age} ~~Pleistocene~~ was a time when man-like characters were appearing simultaneously in different parts of the world.

*We can venture no comments on man as a spiritual being; our evidence lies entirely with his physical structure.

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Homo sapiens, as we know him today, was unquestionably present at the time of the last glaciation, 25,000 to 40,000 years ago. His fossil remains are found in Europe, Asia and Africa, with some suggestion of modern racial types already in existence before the end of the Ice Age.

And what of tomorrow? Has man reached the peak of his development? We hope he hasn't. We hope that future changes in brain tissue may develop his centers of moral values to balance his centers of acquiring knowledge. As yet science has only begun to learn about the more abstract powers of the human brain, and its potentialities for further development.

Looking at living things as a whole, however, it can be said that the evidence of today of frequently occurring changes in hereditary factors, the presence of races, and the close similarities which exist between some species gives strong support to the belief that as long as there is life on the earth, there will be evolution.

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Revised version
to Mont Levine 1/19/80

Suggested definitions to be used with "TO LIVE IS TO CHANGE"

3 MUTATIONS.-- Changes in factors of heredity within the germ cells, resulting in changes in characters of the offspring.

2 GENES.-- ~~and chromosomes~~ The carriers of heredity within the germ cell.

1 CHROMOSOMES.-- Filaments within the nucleus of the germ cells along which the genes are arranged in definite pattern.

4 PHOTOSYNTHESIS.-- The process whereby plants (by means of their green coloring matter) draw upon the energy of the sun to manufacture food from chemical substances in the earth, air and water.

ECOLOGY.-- The interrelationships of plants, animals and their physical environment.

ANIMAL.-- In common parlance the word animal connotes one of the mammal group, such as a dog, cow, monkey, or the like. In the language of science, however, any member of the great Animal Kingdom (from Amoeba to Man) is an animal. It is in the scientific sense that the word is used here.

colloidal
PROTOPLASM.-- The (jelly-like) substance of which all living things are composed.

of animals or plants
2 ADAPTATIONS.-- Habits and structures which are especially fitted to help ~~an~~ the organism to live in a particular place.

4 SELECTIVE BREEDING.-- The singling out of a particular strain of animals or plants, and breeding ~~thereof~~ within this strain, to the exclusion of other members of the group.

2 NATURAL SELECTION.-- Nature's tendency to practice selective breeding by singling out the strains of animals or plants best adapted to the place in which they live.

3 Fossils --

Suggested illustrations

man skull & jaw bone (or skeleton)

Archaeopteryx or other extinct fossil

infant & man

cycle plants & animals

Series which would be 2 species if middle died out.

The idea of evolution has raised much controversy in the past century.

EVOLUTION, much discussed and much misunderstood is, in essence, merely ~~nothing more than~~ an expression of change over an extended time.

To many the word means only "man descending from the apes", and since this insinuation proves unpleasant, ~~they fail to investigate~~ its real significance is never investigated. ~~get it straight~~ significance. To the scientist, evolution refers

to the origin of different types of living things by development from ~~preexisting~~ ^{other living things} life forms. It is not limited to the descent of man or any other one group, but applies to all ~~living things~~ life.

In particular, it applies to the process whereby ~~simple forms~~ ^{the living forms}

which first inhabited the earth gave rise, through an almost infinite branching and rebranching series, to the vast array of living things of today. It further implies that the process is still in motion.

1676 under

Not Published

for leaflet
w Breach
Oct. 19, 1949

To Live is To Change

223

Change is a basic principle in all living things. Life is never static. Consider yourself. Your body is continually undergoing change -- the food you eat builds new cells, and through the years you find it hard to identify your infant photos with the person you are today. Later you marry and your baby son begins the process of growth anew -- similar to you to be sure, but never quite identical. Why is he not identical? Because of nature's remarkable provision that only half of the tiny filaments (chromosomes) in your cells which bear the hereditary factors (genes) shall be passed on to your offspring. The other half needed to provide him with his full quota must come from his other parent. Furthermore, at times actual changes may occur in the chromosomes or in the genes, producing characteristics which had not before occurred in either parent. In a natural state such changes are so small that within a lifetime they may appear unimportant. We have all seen, however, what can be done under experimentation -- producing different breeds of domestic animals or varieties of plants. The change, for example, which produced squat legs in dogs was taken advantage of by man. Selecting out the short-legged individuals from the rest of the stock and breeding them together over a period of time, resulted in the dachshund.

(86)

Selection is practiced by nature, too. Animals and plants in nature must be adjusted to the place in which they live -- to its climate, its geographical features, and to the other animals and plants with which they are associated. The better a living creature is adjusted to its surroundings the more chance it has to survive and to pass on its inheritance to the next generation. In other words, nature tends to select characters which increase the animal's or plant's special fitness for its life conditions. Insert ①

180
Selective breeding by man, or in nature, implies the isolation of the group to be bred, from the parent stock. Whereas man can place his domestic animals in separate pens, nature must depend upon natural barriers -- mountains, rivers, or just distance alone. It is a natural consequence of the multiplying of living things that they tend to spread out in space. New colonies are formed in this way. In each colony, new characters arise which did not occur in the parent stock. After many generations, as a group becomes widely distributed geographically, and different colonies have become fitted for different types of surroundings, the individuals of one colony may be markedly different from those of another. At the same time a more or less continuous and overlapping series of "races" may be traced from one extreme to the other. The extermination of these "in betweens" would leave two distinct forms. In some such manner the minute changes which occur from one generation to the next could eventually lead to separate species, families, or to groups of ~~even~~ more marked distinction.

Insert ② →
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The earliest fossil Primate known comes from rocks of sixty million years in age. Other Primate fossils, dating from 20 to 30 million years ago, suggest that a separate line was even then branching to man as distinct from any one of the living apes. From a million years ago ^{throughout the Ice Age} ~~upward~~, fossil remains assignable to man have been discovered. Some primitive forms, such as Java Man, had heavy ridges over the eyes, a brain of ~~only~~ moderate size (though larger than that of any ape), a receding chin, and rather ape-like teeth. Neanderthal Man, who occurred a little later, had good brain capacity and man-like teeth, though the brow was still heavy and the chin receding. Other representatives of fossil man variously combined ape-like and man-like characters. No definite succession of these early types has been determined. In fact some of them appear to have been contemporaries of each other, suggesting that the ^{Ice Age} ~~Pleistocene~~ was a time when man-like characters were appearing simultaneously in different parts of the world.

*We can venture no comments on man as a spiritual being; our evidence lies entirely with his physical structure.

Tap
the
5-2
cent
years
in
Africa

Homo sapiens, as we know him today, was unquestionably present at the time of the last glaciation, 25,000 to 40,000 years ago. His fossil remains are found in Europe, Asia and Africa, with some suggestion of modern racial types already in existence before the end of the Ice Age.

And what of tomorrow? Has man reached the peak of his development? We hope he hasn't. We hope that future changes in brain tissue may develop his centers of moral values to balance his centers of acquiring knowledge. As yet science has only begun to learn about the more abstract powers of the human brain, and its potentialities for further development.

Looking at living things as a whole, however, it can be said that the evidence ~~xx~~ today of frequently occurring changes in hereditary factors, the presence of races, and the close similarities which exist between some species gives strong support to the belief that as long as there is life on the earth, there will be evolution.

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44
The ~~word~~^{idea} evolution has raised much controversy in the past century, and ~~its~~^{its} meaning has been variously interpreted. Unfortunately, many persons think of it only as "man descending from the apes", and as this insinuation proves unpleasant, they fail to investigate its real significance.

91
~~As generally applied~~^{to} by the scientist, evolution refers to the origin of different types of living things by development from pre-existing life forms. It is not limited to the descent of any one group. It is applied particularly to the process whereby simple forms which first inhabited the earth gave rise, through an almost infinite branching and rebranching series, to the vast array of living things of today. And it further implies that the process is still in motion.

Evolution, then, is merely one expression of the basic principle inherent in all living things -- ^{continuity with} change. Life is never static.

232
(1) Consider yourself. Your body is continually undergoing change -- the food you eat builds new cells, and through the years you find it hard to identify your infant photos with the person you are today. Later you marry and your baby son begins the process of growth anew -- similar to you to be sure, but never quite identical. Why is he not identical? Because of nature's remarkable provision that only half of the tiny filaments (chromosomes) in your cells which bear the hereditary factors (genes) shall be passed on to your offspring. The other half needed to provide him with his full quota must come from his other parent. Furthermore, at times actual changes (~~mutations~~) may occur ^{in the chromosomes or in the genes} ~~in the hereditary factors themselves~~, producing characteristics which had not before occurred in either parent. In a natural state all such changes are so small that within a life time they may appear unimportant. We have all seen, however, what can be done

check mutations of all

1

In the past century the word "evolution" has raised much controversy, and its meaning has been variously interpreted. Unfortunately many persons think of it only as "man coming from the apes", and ^{as this} ~~they~~ ^{insinuation has proved unpleasant, they have failed to investigate further.} are not a little disturbed at the insinuation.

As generally applied by the scientist, evolution refers to the process whereby living things of today have descended by an almost infinite series of changes from the ^{earliest} ~~simplest~~ of life forms which first lived upon the earth. Evolution then is merely one expression of the basic principal inherent in all living things -- change. Life is never static. Consider yourself. Your body is continually undergoing change -- the food you eat builds new cells and through the years you find it hard to identify your infant photos with the person you are today. Later you marry and your baby son begins the process of growth anew -- similar to you to be sure, but never quite identical. Why is he not identical? Because of nature's remarkable provision that only half of the tiny filaments (chromosomes) in your cells which bear the hereditary factors (genes) shall be passed on to your offspring, the other half needed to provide him with his full quota must come from his other parent. Furthermore, at times actual changes (mutations) may occur in the hereditary factors themselves, producing characteristic which had not before occurred in either parent. In a natural state all such changes are so small that within a life time they appear unimportant. ~~We have all seen,~~ however, what can be done under experimentation in producing different ^{breeds} ~~kinds~~ of domestic animals ^{or varieties of plants}. The ^{change} ~~mutation~~, for example, which produced squat legs in dogs was taken advantage ^{of} by man. Selecting out the short-legged individuals from the rest of the stock and breeding them together over a period of time, resulted in the dachshund.

The first step in the evolution of man is the ape.

Selection is practiced by nature, too. Animals and plants in nature must be adjusted to the environment in which they live -- ^{place} that is to the climate and ^{its geographical features,} topography, and to the other animals and plants with which they are associated. The better ^{an animal is adjusted to its surroundings} fitted an animal is to the place in which it lives, the more chance it has to survive and to pass on its inheritance to the next generation. In other words, ~~nature's~~ criterion of selection is adaptation, or fitness, for the environment.

~~Nature tends to select characters~~
Consequently the mutations which nature selects tend to increase the ^{organism's} special fitness for its life conditions.

Selective breeding by man, or in nature, implies the isolation of the group to be bred, from the parent stock. Where ^{at} man can place his animals in separate pens, nature must depend upon natural barriers -- ^{into rivers, or just distant mountains, but when anatomical or physiological changes} these may be a matter of space or topography, at the outset, but eventually, ~~sexes are separated~~ they become physiological so that mating is no longer possible. It is a natural consequence of the multiplying of living things that they tend to spread out in space. New colonies are formed in this way, and inbreeding occurs within each colony. ^{on} Each colony, of course, carries with it some characters from the parent stock, but ~~inbreeds its own mutations~~ ^{new characters arise which did not occur in} After many generations, where a group ^{has become} ~~becomes~~ widely distributed geographically, the individuals at the geographic extremes of range may be markedly different, though a more or less continuous and overlapping series of ^{"races"} ~~forms~~ can be traced from one extreme to the other. The extermination of these "in between" would leave two distinct forms. In some such manner we may conceive of how the minute changes which occur from one generation to the next may eventually lead to separate species, families, or to groups of even more marked distinction.

Evolution then is merely ~~an~~ expression of change over an extended time.

78 Nature being infinitely more patient than man, does not achieve her results according to man's time scale. Nature's time is geologic time, calculated on the basis of the major earth movements which have occurred in the course of the earth's history, and measured in Eras, ^{divided} into Periods, and then Epochs. The duration of even the ~~shortest~~ Epoch runs into millions of years. To appreciate ~~nature's time scale~~ ^{has} the changes which nature/achieved ~~by the passage of time~~ we must adjust our thinking to geologic time.

47 ~~Perhaps~~ We may best do this by turning our attention to the fossil record. ^{For} fossils -- the remains and traces of animals and plants which lived in past geologic ages -- ^{found in the ancient rocks then} furnish our ^{only} tangible means of knowing about life far far back of our own experience on earth.

56 The very earliest identifiable fossils come from rocks nearly a billion years old. The only kinds of life represented by these fossil remains ^{are Bacteria,} ~~is of plant types related to the simplest of seaweeds,~~ ^(algae) and ~~animals related to the sponges.~~ Still older rocks contain carbonaceous deposits which indicate life was present, ^{though} ~~but~~ no specific types of life can be identified.

106 By the time we arrive at a date of about 440 million years ago * a number of kinds of animals and ^{algae} ~~seaweeds~~ were recognizable, but all were marine dwelling forms, and there were no back-boned animals. It is difficult to picture the land barren of life, and the sea without fish. The story continues with successively younger rocks; ~~telling of~~ the first appearance of land-dwelling plants and animals, the occurrence of back-boned creatures -- ~~at first~~ ^{at first only} in the sea, to be followed by the ^{one of the land,} interesting "lung-fishes", which could live out of water when necessary -- these followed by the ^{amphibians} ~~amphibians~~, and the ^{reptiles} ~~reptiles~~. For 60 million

*The calculation of geologic time in terms of years is based upon the contained radioactive minerals.

207 X
In this account of the fossil record, it should be noted that many linking forms occur which suggest the manner in which one form arose from another. For example the "bird-reptile", Archaeopteryx ~~xxxxxxx~~ of 150 million years ago, provides ^{convincing} evidence that birds descended from one branch of the reptiles, while the ~~bird~~ mammal-like *cyonodons* of ^{still} ~~slightly~~ earlier times, indicate the offshoot of the mammals from another reptilian line. It should always be kept in mind that ~~xxxx~~ transitions of this nature ~~xxxx~~ ^{have been} ~~the whole been~~ gradual -- each was ~~xxxxxx~~ and ~~xxxx~~ ^a apparently a product of the particular age in which it ~~xxxx~~ occurred. We would, not, in other words, ~~xxxxxxxcxcxcxcxcxcxcxc~~ expect to find the eggs of a lizard, hatching into a chicken! ~~xxxxxxxcxcxcxcxcxcxcxc~~ The reptiles from which the group of birds ~~stemmed~~ ^{descended} off ~~werexcxoxexyxcxcxcxcxcxcxc~~ were possibly the ancestors of the dinosaurs as well. The first bird-like ~~form to arise from them~~ ^{bird} had a skeleton like that of some of the small dinosaurs ~~xxxx~~ which ran on their hind legs. It had jaws with sharp-pointed teeth, instead of the toothless beak found in modern birds. But combined with its reptile-like structure were feathers stemming from the short front limbs, along the body, and down either side of a long bony tail.

1

* We can venture no comments on man as a spiritual being; our evidence lies entirely with his physical structure.

years, beginning about 200 million years ago, the fossils ~~found~~ indicate ~~that~~ reptiles ruled the world, -- This was the time of ~~the~~ dinosaurs on land, ~~the~~ pterosaurs in the air, and several kinds of "swimming lizards" in the seas and rivers. Scant ^{evidence} ~~remains~~ of the first bird-like creatures, and of tiny mammals also appeared during the time of reptile dominance, but not until about 60 million years ago did they appear in large numbers and ^{increased} ~~great~~ variety. ^{Insert yellow sheet on birds & mammals} As we consult the rocks nearer and nearer to our time, the animals and plants contained as fossils are more and more like those we see around us today. Forty thousand years ago a great many forms practically indistinguishable from those of today were in existence. Is it any wonder that we have not been able to witness within our short life span the transition in nature from one species to another?

What do we know of the past of man himself? By a comparison of man's body structure with that of higher animals, we learn first of all that physically* he fits into the Class of mammals -- those warm-blooded forms with hair, which suckle their young. Among the mammals, man's structure is close to that of the Primates -- the Order which also includes the monkeys and apes and the little marmosets and lemurs. Primates ~~all~~ ^{emphasize} ~~tend to have good-sized brains,~~ ^{development,} the eyes are usually directed forward, limbs are long, with 5 toes and fingers, and either the thumb or big toe (or both) are separated from the other digits for grasping; many of the Primates tend to walk in a semi-erect posture.

The ^{earliest fossil} ~~most primitive~~ Primate known is from rocks of 60 million years in age. ^{other} Fossils ^{from} Primates dating ^{ago} back 20 to 30 million years suggest that a separate line was even then branching to man as distinct from any one of the ^{living} apes. From a million years ago upward, fossil remains assignable to man have been discovered. Some ^{primate fossils} such as Java Man, ^{Peking Man} had heavy ridges over the eyes, a brain of only moderate size (though larger than that of

Within the Primates, blood tests indicate closest relationship of man with the man-likes.

146

82

144
any ape), a receding chin, and ~~(in the Java type)~~ rather ape-like teeth; Neanderthal Man, which occurred a little later than the ~~Java and Peking Man~~, had good brain capacity and man-like teeth, though the brow was still heavy and the chin receding. ^{representative of modern man} Others variously combined ape-like and man-like characters. No definite succession of these early types ~~has~~ ^{some of them appear} been determined. In fact ~~it appears that~~ ^{to have been contemporaries of each other} some occurred at the same time, suggesting that the Pleistocene was a time when man-like characters were appearing simultaneously in different parts of the world. Homo sapiens, as we know him today, was unquestionably present at the time of the last glaciation in the Ice Age, 25,000 to 40,000 years ago. His fossil remains are found in Europe, Asia and Africa with some suggestion of ^{modern} racial types already in existence before the end of the Ice Age.

62
And what of tomorrow? Has man reached the peak of his development? We hope he hasn't. We hope that future changes in brain tissue may develop his centers of moral values to balance his centers of acquiring knowledge. As yet science has only begun to learn about the more abstract powers of the human brain and its potentialities for further development.

48
Looking at living things as a whole, however, it can be said that the evidence today of ^{frequently} ~~ever~~-occurring ^{changes in hereditary factors} mutations, the presence of ^{and} ~~geographic~~ races, ^{which exist} the close similarities between some species gives ^{strong support to the belief} assurance that as long as there is life on the earth, there will be evolution.

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Radius from San Pedro ^{length of intermus. line}

Proximal end of left radius of a large goose ^{dist. from prox. end of intermus. line}
 a breadth of head across capital tuberosity

	^a	^b	^c	^d	^e	^f	^g
	10.0	6.0 mm	= 6.00%	54.6	18.2	900	303.3
Branta	560	10.6	6.4	6.03	46.8	18.9	700
	207	10.2	6.8	6.17	46.3	18.5	738
	323	8.9	5.4	6.06	44.0	16.7	814
Chen	676	7.6	5.4	7.10	27.6	20.0	511
	865	7.0	5.4	7.71	30.3	15.4	561
Anser	330	7.2	5.2	7.22	27.9	15.9	536
							357.6

In 1914 Miller (1914) identified 16 species of birds from the Upper San Pedro at the locality referred to by Arnold as the "Lumber Yard". Recently another specimen of bird bone has been found ^{by P.C. Orr} to the north of the "Lumber Yard" along a cut along the highway between this locality and the town of Wilmington. The exact location is given as one ^{and one fourth} miles ~~from~~ south of Wilmington city limits on the highway.

Early mss (about 1928)
 never published but specimen
 later recorded in brief with others
 Howard 10/24/50

Description of bone

Proximal ~~end~~ ^{half} of left radius of large goose;
~~probably~~ ^{near} Branta canadensis. The identi-
fication is ~~given~~ ^{made} as tentatively in view of
the great variability to be encountered in
the avian skeleton, and of the fact
that the radius at best is an unsatisfactory
bone on which to place identification. The
fossil specimen has been compared with two
specimens of Branta canadensis, one of
Branta canadensis hutchinsoni, one of Chen, and
two of Anser albifrons. It is placed with
Branta canadensis on the basis of the following
characters: (1) Size; (2) ratio of breadth of shaft
to breadth of proximal end; (3) ~~ratio~~ ^{character} of external
intermuscular lines. The shape of the bicipital
attachment & the capital tuberosity are not
considered, since they vary within one species.

The size and ratio of breadth of shaft
to breadth of proximal end are shown in
the table. The external intermuscular
line is relatively longer than in any of the

available Recent specimens, those of the genus *Brauda* ^{most nearly} approach it, ~~not~~ ^{at the prox.} ~~closely~~ ^{end} ~~the~~ ^{relative} ~~distance from the~~ ^{proximal} ~~limit~~ ^{limit} of the line, is approximately the same as in *Brauda* and *Ausei*, but is considerably less than in *Chen*. In shape the line is less straight than that of ~~the genus~~ ^{near *Brauda*} ~~than in *Brauda*~~, ^{slight} its curvature differs also from that in *Ausei*. ~~The position of the line, is very close to *Brauda*~~

Measurements

	Breadth of head ¹	Breadth of shaft ²	approx. c length of int. line
Fossil	10.0 mm	6.0 mm.	54.0 mm.
<i>Brauda canadensis</i>			
560 ³	10.6	6.4	46.8
207	10.2	6.3	46.5
<i>B.c. hutchinsi</i>			
323	8.9	5.4	44.0
<i>Chen</i>			
676	7.6	5.4	27.4
<i>Ausei albiporus</i>			
330	7.2	5.2	27.9
865	7.0	5.4	30.3

- ¹ measurement taken across capital tubercle
² measurement taken with bone in same position as for a, about $\frac{1}{4}$ from proximal end
³ all Recent specimens from collection of S. H. Miller.

Miller (1914) identified Branta
canadensis in the Upper San Pedro
beds at the locality referred to by
Arnold as the "Lumber Yard". This
identification was based upon the
distal end of a humerus.

left
finger

nit

left

finger
left

Brown.
00000
0000

clay.
angular.

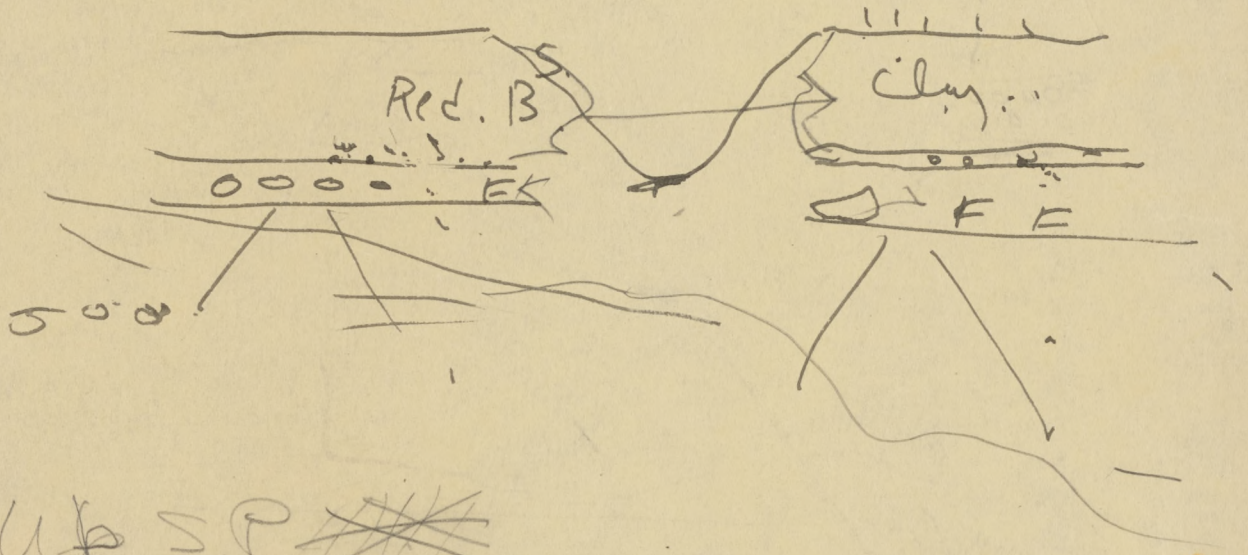
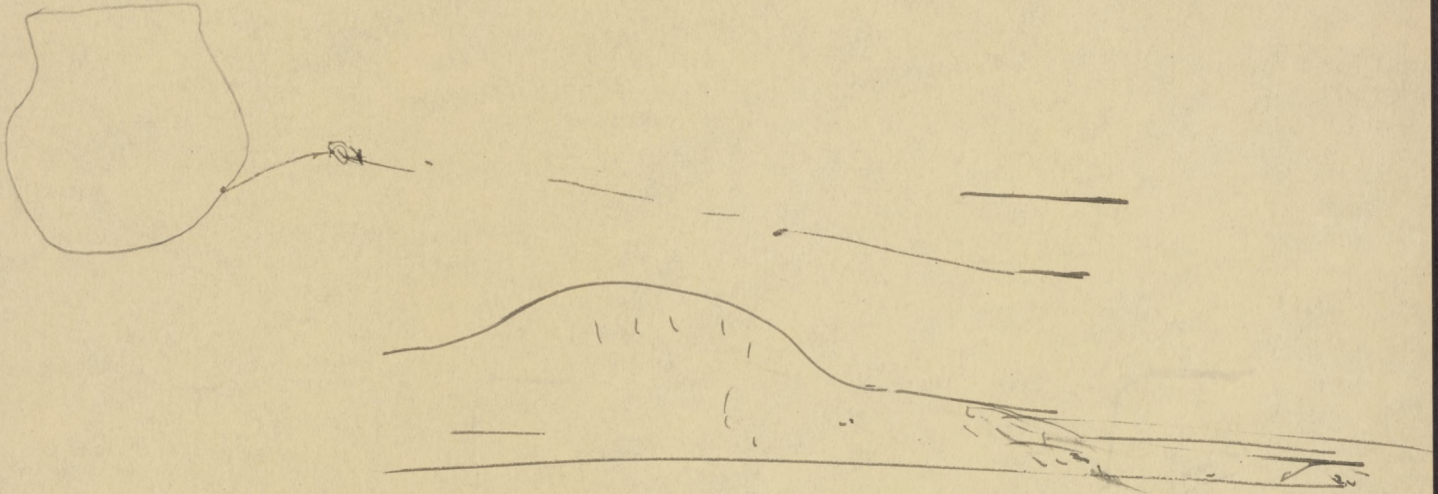
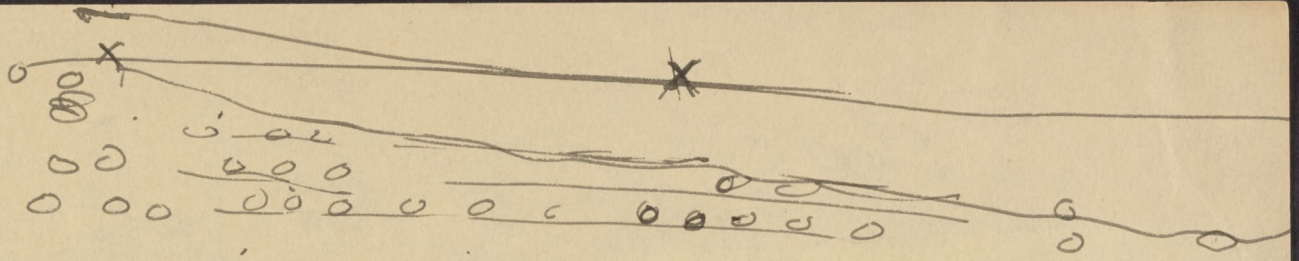
DE.

Bird.

Wilmington.

olive st.

Pedro.



up SP ~~XXXX~~
 Saw SP
 Plio

Red clay
Brn.

20-25

XX BIRD.

2-10

Shells - Pectens

3'

25' talus

Wil. city limits

1 mi

Road.

Other fossil bed

trail road

fossil bed
where bird was found



(4)

165m

→



✓

try 45



Ken Sager

Nov. 1929

Reports of Hilday and Howard

130-1
25
"

✓

Miss Howard

HERBERT N. MCCOY

2537 FIFTH AVENUE

LOS ANGELES, CALIF.

She got up
and shook
herself
before
continuing
her journey



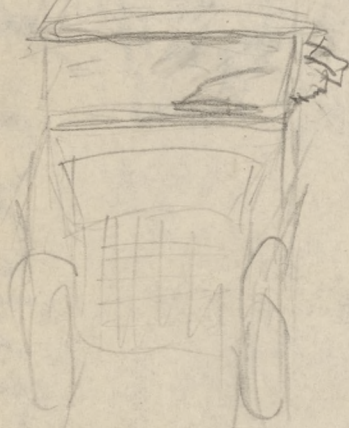
She would swim on one side facing
herself with her beak as she swam



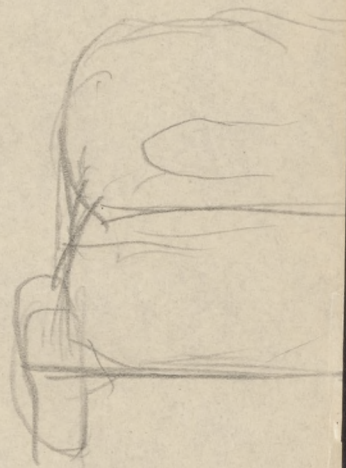
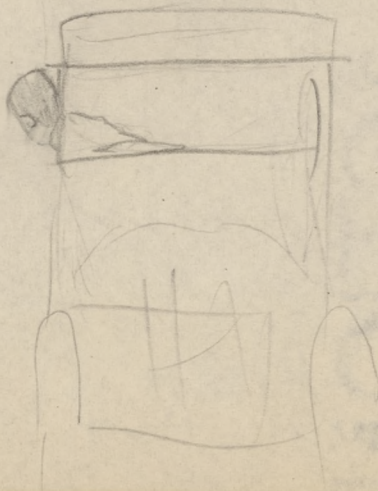
She balanced precariously
after her jump up!



The door was ajar and Penny was
off to explore unknown fields



There she was
walking across
the sheet in the
midst of traffic.



Centwell

Taking him from car. Got out of box jumped on seat and jumped out on street into traffic and went walking across traffic to the other side of the street.

Wouldn't eat anything but live fish. Once ate a dead fish (many trials). Cut fish, would take in mouth but ~~wouldn't eat~~. ~~threw~~ it off sideways - one cut piece eaten 2 dozen trials. Even a cut piece under water he'd touch but wouldn't eat.

Put dead ones in his feet & stirred 'em up as they moved etc. Two floating then at the rest dead on bottom of tub.

Habit of all diving birds put eyes under water & start swimming - 15 ft. he can see a fish. Faster under water than grebe. No movement of feet, no swimming - all done with wings regularly like flying. Scarcely a ripple.

Jack

Likes to chase green paper. No interest in white paper or red-Snapat paper & gum. But it has ~~to~~ ^{its} ~~store~~ ^{store} shoulder

Tub of clay with water on top. Climbed up & dived in - covered with mud. Washed him under hydrant.

Tail hit going down stairs upset his balance.

Tried to jump thru glass in auto. Climbed on Jack's shoulder to look out auto window.

Posed for picture.

Didn't like stone

Followed around - upstairs & down

✓✓✓

jumping

Started to take him from cage
jumped up and down and made
guttural grunts in throat.

Taught to jump over leg or
hand - Clear over if he could - otherwise
on leg then down the other side.

Wash tub with rock for bathing.
Cage $4\frac{1}{2} \times 2\frac{1}{2}$; box ~~of sawdust~~ upside
down on sawdust floor near tub
to help him into tub. Hop into
water - shake his tail & preen himself.
Sun himself on rock or on floor
on sawdust.

On cage all night - let him
out til mid. attendant found
him waiting at door and would
walk out & down hall if allowed.
Hopped into bucket of sawdust.

Cantwell cont'd

Air bubbles from back of neck.

Swallowed fish under water

Roll ~~on side~~ ^{over} & kick feet a little. Swam on side scratching under wing with bill as he did so.

Diving ^{into} the pool he jumped — a "belly flop"

Voice — throaty grunt with mouth open and fast when excited, with mouth closed and slower for begging.

No parasites

Knew way to pond. ~~Then~~

Couldnt swallow a $1\frac{1}{2}$ "

brood size fish ($2\frac{1}{2}$ in. long) started but couldnt make it. Cormorant that size would eat fish much bigger than that.

Slough. First saw slough saw fish & tried to get to him. Next time got right out of top & started for where he'd been tried the first time. Stayed 2 hrs ate ~~several~~ fish $\frac{1}{2}$ " long. Top Murreons.

Centrues cont'd

At slough - didn't get out on
bank - stayed in for 2 hrs.
Gone home didn't try to get out
of box (gone out he did)

Swim up to edge when
ready to get out of pond.

Never tread water to
shake water off ^{feathers} in water. When
out of water would shake wing
body & tail.

Didn't object to string tied
to foot while swimming

Didn't like the dark. Wouldn't
stay in dark - liked to bask in sun
Always walked out in the open.

On November 1, 1929, Penny was brought to the Los Angeles Museum at Exposition Park, Los Angeles, California. Here her headquarters were established in the Junior Museum where she was given a cage containing a galvanized iron wash tub full of water with a rock partially placed out of the water for her to stand or lie on; the floor of the cage was covered with sawdust, and the whole was wire enclosed to prevent onlookers from handling Penny too much, as well as to prevent her from walking out. ^{on the morning} Before the Museum opened, however, she was allowed to roam about the halls or in some of the offices.

During the month in which Penny was at the Museum we were able to learn many things regarding her habits and adaptability.

Feeding was, of course, the greatest problem in attempting to keep a marine fish-eating bird twenty-five miles from the sea. It was found, however, that Penny would accept fresh water fish as a substitute for her normal diet. The arrangement was made whereby she was allowed to feed in the fish pond in the park at least once a day, and once a week she was taken to Nigger Slough to feed while more fish were collected to replenish the fish pond.

As far as could be observed, Penny ate only small fish varying from one-half inch to one and one-half inches in length, for the most part "Top Minnows". Mr. George Cantwell, assistant Ornithologist at the Museum made several experiments with regard to the feeding habits of the bird which disclosed the following facts: Penguins evidently cannot eat as large fish as can a cormorant of equal size. Penny attempted to swallow a Sunfish one and one-half inches broad by two and one-half inches long, but could not get it down. On only one occasion did Penny eat a cut piece of fish which Mr. Cantwell handed to her, though he tried two dozen times to get her to eat fish in this way. Even when the pieces were floated in water she would only poke at them and then leave them. These experiments were made when

she had not eaten for several hours and when it ^{might} ~~would~~ be supposed that she would be hungry. Twice when uncut, dead minnows were put in water and the water stirred so that the fish appeared to be moving, Penny ate them. On one occasion a quantity of dead fish were emptied into the fish pond along with the live ones brought from Nigger Slough; Penny swam about among them snapping one after the other, dead or alive until the water became calm and the dead ones sank to the bottom. On the other occasion several dead fish were put in the tub in her cage; the water was stirred and three or four fish floated to the surface; Penny ate these and then took the others from the bottom of the tub. In only one instance did she take a dead fish from Mr. Cantwell's hand.

Whenever Penny was taken out to the fish pond, she became the center of an admiring and interested throng. The railing about the pond is about a foot above the water. To get into the water from the rail, Penny did not dive, she jumped, executing what is commonly known as a "belly flop". After this one splash, however, the water scarcely even rippled as she swam about, darting here and there after fish. Though a somewhat ludicrous creature on land, in the water a Penguin cannot be excelled for grace and ease in swimming. ~~Penny's method of swimming would better be described as flying under water, the short, paddle-like wings beating the water evenly as with a bird in flight, the legs held out behind. A large part of the time she swam entirely under water, catching fish as she swam, and coming up only at intervals to breathe. Since her legs were motionless, there was no trouble in attaching a string to one foot to enable us to pull her to the railing when it was time to take her into the Museum again. Penny made no objection to having the string, but when it was removed, she swam more swiftly and went into other parts of the pond, and beneath lily pads in which the string would have become entangled. After using the string a few times, it was found to be unnecessary, ^{of her own accord,} ~~as~~ for she would come to the edge of the pond, where one of us was sitting, and wait to be taken out; the railing was too high to enable her to get out alone.~~

When Penny first entered the water, she immediately put her eyes under water and began her search for fish, darting first in one direction and then in another. As her appetite became satisfied she was content to swim about leisurely in an even course, sometimes rolling over, using her feet to kick with as she did so. Again she swam, or floated on one side while preening her feathers with her beak. She was never observed to tread water and shake herself as with some other types of water birds, but once out of the water, she ~~xxxx~~ extended her wings and shook out her feathers and twitched her tail before starting to preen. She enjoyed standing in the sun, with her back to the sun itself. In this way the feathers of her back dried quickly. If we turned her around so as to allow the sun to dry the feathers on her breast, she turned back again immediately, no matter how often we repeated our attempts to make her face the sun.

Though ordinarily very active, after an hour or two in the pond or slough, Penny became quiet and was ready when returned to her cage to stand or lie in the sunlight without running about. *In lying down a napping her head was drawn close to her body but remained facing forward.*

On land Penny walked, she did not hop. Her position in walking was about as in the photograph shown in figure 1, with her wings slightly extended, though motionless. *used as balance* Her gait was surprisingly rapid for her size and build, comparable, perhaps, with a toddling child. Apparently the Galapagos Penguin is accustomed to being in the open and does not take to crevices or dark places. When Penny ~~xxxxxxxxxxxxxxxxxxxx~~ she was put in a dark place between two cases, but her efforts to get ~~xxxxxxxxxxxxxxxxxxxx~~ out into the light were so noticeable that she was soon removed from ~~xxxxxxxxxxxxxxxxxxxx~~ such confinement. When allowed to roam in a room she always marched

However, she never out in the open never going into corners to hide. ~~xxxxxxxxxxxxxxxxxxxx~~ avoided obstacles in her path if it were possible to go over or under ~~xxxxxxxxxxxxxxxxxxxx~~ them, even though to have avoided them meant a deviation in her course of only a few inches. In walking about in my room one day the cord to the gas ~~ecove~~ heater lay across her path. She either didn't see it

*x napped standing
lying down on rail.
or wings out stretching with
usually the latter*

or didn't care, for she stepped right ~~on~~ it with one foot, almost losing her balance on its rounded surface. When alighting on any object ^{however} with both feet, ~~no~~ matter how thin the edge, Penny had remarkable balance considering her flat, padded feet. I have seen her jump from the stone in the middle of the tub in her cage to the edge of the tub, and balance there a moment before jumping to the floor. ^{If a} ^{lay} ~~Larger~~ obstacle in her path she jumped onto it with both feet and off again on the other side. In fact she seemed to enjoy jumping on and off of objects, ~~of~~ wherever she found an accessible box in a room she came back to it repeatedly, jumping up on it each time. Penny's desire to jump onto things sometimes got the better of any intelligence she may have had, for I have seen her try to jump from a low six inch box, set back a few inches from the window, to the window sill, a distance of about two feet. Of course this attempt resulted in her fallin on the floor between the box and the wall. She often went up and down stairs, and was very adept at mounting them. Her descent, however, was ^{sometimes} ~~often~~ very awkward, for in jumping down, her tail caught on the step she was leaving, resulting ~~in~~ usually in her falling forward onto her breast. ^{shaking her head & needed coaxing} On one or two occasions she rolled all the way down the steps. Apparently penguins are accustomed to falls, for Penny often fell, but was always up and away again without having even her feelings hurt. In encountering an obstacle too tall to go over, but raised from the ground, Penny squatted down and scooted under.

Penny's voice was seldom heard. On rare occasions she became excited in her eagerness to leave her cage, at such times she would hop up and down and grunt a throaty little grunt. If excited by thrusting a stuffed bird at her she would make the same grunting noises, but in more rapid succession and with her mouth open head extended, ^{and wings} and even attempting to attack the stuffed bird if it were brought close to her. Mr. Jack Von Bloeker found that Penny showed the same excitement and

desire to fight when a piece of green paper or cloth was waved in front of her, though white or red failed to get any response.

Penny had an insatiable curiosity. Allowed to roam in a room, she investigated everything. This characteristic led Penny into several embarrassing situations. One of the most ridiculous of her dilemmas occurred in the taxidermy shop. Here she wandered about under the feet of two mounted giraffes, and over papers and boxes until she came upon a tub in one corner. The tub was filled with soft clay covered over with a thin film of water. Presumably Penny saw only the water, or perhaps, even only something to jump upon, at all events in she jumped. She was pulled out, completely plastered over with clay, and held struggling beneath the water faucet. When being taken to Nigger Slough, Penny wanted to get up to the window of the automobile, and even made several attempts to jump out. On one occasion she did jump out, and was serenely waddling across the street in the midst of traffic, before she was discovered.

Penny's reactions to captivity were in many ways more like those of a puppy than of a bird. She was very docile, sometimes squirming a bit when picked up, but often seeming actually to enjoy being handled. I have seen her settle down for a nap while I scratched her back. Like a puppy she followed persons about, even up and down stairs, and on several occasions would have gone out into the street to follow someone had she not been restrained. It would appear from such behavior that she recognized certain persons, since the ones she was most prone to follow were those with whom she was most often in contact. Also her grunting to be taken from the cage was a performance only enacted for certain ones who came to liberate her.

Whether she recognized persons or not, it is certain that she recognized places. The second time she was taken to Nigger Slough she made for the spot where she had entered the water upon her first visit, as soon as she got out of the car. She was well acquainted, also, with

the route from the Museum to the fish pond in the park, though the pond was not within sight from the Junior Museum entrance. No sooner was she liberated from her cage than she was out the door, up the four steps to the street level, and off across the lawn to the left. After crossing the lawn she had several steps to descend and some distance to travel over the ^{grass} lawn in the sunken rose garden. All of this distance she would walk by herself without prodding. We could never get her to walk back to the Museum again, however. No matter how far we would carry her, as soon as she was put down again she turned and waddled back toward the pond.

~~Penny~~^{ant Curator} Very little attempt was made to teach Penny any tricks, though Miss Virginia Rice of the Junior Museum, succeeded in getting her to jump over her ^{arm} leg or through her hands. Penny usually accomplished this in two jumps, first onto the leg or hand and then down the other side, though occasionally she jumped completely over. These tricks were performed only when Miss Rice placed herself directly in Penny's path, so perhaps Penny was not aware that she was performing, since her natural tendency was always to jump over anything in her way.

On the morning of November 30, Penny was found dead in her cage. She had been getting very thin in spite of every effort to keep her supplied with fish. On Thanksgiving day she spent the whole day at Nigger Slough, ~~feeding xxxxxxxx~~ going in and out of the water as often as she cared too. ^{It may be} ~~perhaps~~, like many of her human brothers she was not careful of her diet. On November 29 she was very sick, and died during the night. It is, perhaps, remarkable that an essentially marine bird should thrive for even a month in an environment where only fresh water and fresh water fish could be provided for her.



gr. length skull 196
basal length 183
br. zygomatic 96.2
length tooth row 100.0
br. across rostrum 53.5
br. back of bullae 62.0 ✓
p.o. br 38.3 ✓

C. E. HARLAN

snout br 30.3 ✓
br. premaxillary 59
length maxilla 141 (to condyles)
br. across condyles 80

MADISON 7411

EXTENSION 151

156

U. S. FOREST SERVICE

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animal's measurements

length nose to end ^{of} bony tail -	60 "
length plume	16 "
height at shoulder	27 "
weight in lbs	50-60

9

Sgt. Andrews runs prison camp
one of workers has house
Tollie near ^{Oak} Canyon

Bill Reeder will give data

2/20/47

Skull & mandible of coyote from C.E. Hurlan
Recd Jan. 5, 1945-

Length equalled by skulls in our collection
but br of cranium (at brain case, at p.o. indent.
and at occipital outgrowths beside bullae) slightly
greater) also br of snout slightly greater.

(Does not resemble wolf or ^{domestic} dog because)
M. 2 is larger as in coyotes.
Also breadth is not nearly so marked as in
wolf & dom. dog.

Skull long & straight while deep & wolf
have slightly bowed up skull

auselygo
Lewis (Ranger) (has a sheep's head)

Lendora Ranger Sta.

{ Cattle Canyon
East Fork of San Gabriel River }

~~1942~~

Skull measurements on Coyote specimen (X) from San Gabriel Canyon

	A	B	C	D	E	F	G	H	I	K	I/D	F/A	J/C					
	Length of skull	Basal length	Length of tooth row	Breadth across molars	Breadth across zygomatic	Length of snout at post-orbit	Breadth of brain case	Breadth of forehead	Breadth of back of skull	Br. M2	Br. post-nasal of Bullae	Ratio M2 to basilar width	Ratio Br. brain case to ear skull	Ratio Br. snout length to tooth row	Orbital angle	Br. pal to dist. tooth row		
M1559 Specimen X	197	180.6	102.0	54.5	96.8	31.0	59.7	51.4	38.7	11.4	47.2	20.9%	30.3	30.4	48°	53.4		
Coyote 526	192	173.5	98.2	54.2	94.6	28.3	57.3	41.1	36.0	12.0	43.1	22.1	29.8	28.8	44°	55.2		
" 525	196.2	180.0	100.8	52.0	94	27.9	56.3	42.8	33.5	11.5	46.0	22.1	28.6	27.7	40°	26.4		
" 1340	191.5	177.2	101.2	50.5	91.0	29.0	57.4	44.3	35.2	12.3	45.2	24.3	29.9	28.7	45°		Coyotes have larger	
" 1359	180.1	169.5	96.8	53.1	89.5	26.4	55.5	39.8	32.7	12.1	43.7	22.8	30.8	27.3	43°		brain case than	
" 820	196.3	182	102.4	54.0	96.8	29.2	58.6	39.5	32.3	12.4	46.2	22.9	29.8	28.0	45°	27.9	dog or wolf	
" 1510	183.2	173.0	98.2	47.6	86.0	26.0	56.6	37.4	33.0	11.0	42.8	23.1	30.9	24.5	42°	26.0	spec. & like coyote	
" 823	186.2	174	99.8	51.5	96.4	29.1	54.7	39.0	31.5	11.6	45.0	22.5	29.4	29.1	41°	27.6	M2 in coyote wider	
" 683	200	184.5	104.5	52.4	98.2	29.0	57.5	48.0	34.6	11.6	45.5	22.1	28.7	27.7	42°	26.2	spec X, between 2	
L. chinensis																	Snout narrower in coyote	
" 8145 (coll.)	177.0	166	95.5	49.8	87.4	21.4	59.0	41.0	33.0	11.4							spec X, between	
mauro																	Orbital angle less	
" 4914	184.2	—	95.8	51.0	—	28.0	—	45.0	34.3	11.0							in coyote	
Callie																		
" 180	202	191.2	103.4	58.2	96.0	34.4	56.6	56.6	38.6	10.5	50.5	18.1	27.3	33.2	53°	56.3	spec. X, bet. 2	
Y. mitchellii																		
" 1438	209.5	191.0	107.0	58.3	95.1	34.1	54.6	49.3	39.4	10.0	51.3	17.1	27.1	31.9	57°	54.5		
ad mitchellii																		
" 1437	221.2	205	119.5	67.5		38.0	60.0	60.1	43.6	10.9	57.0	16.1	27.1	31.8	56°			
German Polyp																		
" 235	217.8	206	111.0	67.3		37.1	56.4	57.5	34.2	11.6	59.0	17.2	25.8	33.7	53°	20.9		
Wulf																		
" 1338	250		126.0	82.0		45.4	61.7	77.2	48.4	14.8		18.0			65°			

A CANID SKULL FROM CATTLE CANYON,

SAN GABRIEL RIVER, CALIFORNIA

Hildegard Howard

*Never submitted
for publication*

On January 5, 1946, United States Forest Ranger, Anselmo Lewis, turned over to me a skull of a large canid which had been trapped a few days previously in Cattle Canyon on the east fork of the San Gabriel River, Los Angeles County, California.

The animal was a female, and had aroused the interest of Mr. Lewis because of its large size. The question was raised as to the possibility of its being wolf, and the specimen received considerable publicity in the local newspapers. According to Ranger Lewis, the trapper made the following measurements before skinning: length, 60 inches from tip of nose to tip of bony part of tail; length of plume, 16 inches; height at shoulder, 27 inches. Mr. Lewis states that he, himself, confirmed these measurements after the animal was skinned. I have not seen the pelt.

The skull (now L.A. Co. Mus. no. M 1559) shows the unmistakable characteristics of a coyote as contrasted with wolf, i.e., smaller size, greater slenderness, comparatively little rise from snout to frontals, and relatively larger brain case. It does, however, exhibit slightly greater breadth of rostrum and breadth across the frontals than the coyote skulls with which it has been compared. Also M^2 is slightly narrower (transversely), and, although the skull is relatively straight, it shows a little greater rise to the frontals than do the coyote skulls at hand. These deviations from the coyote all suggest the possibility of a hybrid coyote and domestic dog.

Characters of a known coyote-dog hybrid cited by Hall (American Midland Naturalist, 1943, vol. 29, p. 371) are very similar to those noted in the San Gabriel specimen. The following table is modified after Hall. Some characters are added and others, which do not seem to hold in the dog specimens examined, are omitted.

*nearest mouth of Cattle Canyon has a 5 collie
which has free run of the country side.*

	Coyote	Dog	San Gabriel skull	Hall's
frontal sinus	uninflated	inflated	intermediate	hybrid intermediate
breadth across frontals	narrow	broad	intermediate	
orbital angle	41-45°	51-58°	48°	48°
rostrum	narrow	broad	intermediate	broad
tympanic bullae	inflated	less inflated	inflated	inflated
inner half of M ¹	large	small	large	large
size of M ²	large	small	intermediate	
relative breadth of brain case	broad	narrow	broad	

	Measurements			Collie no. 180	German Shepherd no. 218	San Gabriel skull 197
	Coyote min. max.	Wolf L.A.M. no. 133				
Greatest length of skull	180 200	250		207	218	
Breadth across frontals	37.4 48	77.2		56.6	57.5	51.4
Ratio breadth rostrum to length tooth row	26.5% 28.8			33.2	33.7	30.4
Ratio breadth M ² to breadth palate	22.1 % 24.3	18.0		18.1	17.1	20.9